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ABSTRACT

The linguistic form of a nonliteral expression, and the context in which it occurs, can greatly influence young children's succcess or failure in assigning a meaning to a figurative expression. Experiments have shown that the same metaphorical expression can be easier to understand when expressed in a linguistic form that is familiar to young children, and thus more likely to be known given the limited linguistic knowledge of the young child. Because of this limited knowledge, children depend heavily on contextual information when they assign a meaning to a linguistic input. By hearing and trying to make sense out of metaphorical language in a variety of contexts, children can gradually become aware of the different uses of nonliteral language and of the variety of meanings they might express. In addition, the relationship between the contextual information and the linguistic input can affect the information processing requirements of the comprehension task and thus facilitate or hinder comprehension. Furthermore, experiments have demonstrated that what matters is not so much whether a given metaphorical sentence is expressed as a simile or as a metaphor, or whether it is more or less predictable on the basis of the context, but rather the level of difficulty of that metaphorical sentence. (HOD)

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Technical Report No. 340

CONTEXTUAL AND LINGUISTIC FACTORS IN CHILDREN'S COMPREHENSION OF NONLITERAL LANGUAGE

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Contextual and Linguistic Factors in Children's Comprehension of Nonliteral Language

Despite earlier beliefs that the comprehension of nonliteral language does not develop until late childhood or early adolescence, it is now widely accepted that even preschool children can understand certain figures of speech under some circumstances. The early emergence of many of the skills related to the comprehension and production of figurative language does not, of course, mean that this development is complete. There is great improvement in children's ability to deal with nonliteral forms of language during the preschool and elementary school years.

In my view, children's ability to understand nonliteral language is controlled to a large extent by three kinds of quite general limitations. Perhaps the most obvious constraint on the ability to understand resemblances between things lies in the knowledge that the child (or the adult for that matter) has of those things. I will call this the epistemic limitation. Thus, if a child is being told that "the brain is like a computer" his/her understanding of that utterance will depend critically on what the child knows about computers. Clearly, if the child knows nothing about computers (has never seen one, has never heard of one, etc.) the comparison will be incomprehensible. Even if the child knows something about computers, her computer

schema may still be too underdeveloped to allow an understanding of the comparison.

The second limitation is a linguistic limitation. Even if children have the conceptual knowledge underlying a given linguistic sign, this conceptual knowledge must be accessible through the medium of language--in short, children need to know the names of things. Similarly, at the syntactic level, children must know what kinds of interpretations are possible for a given syntactic form, as when they must recognize that a predicative statement can sometimes be interpreted as an implicit comparison. Finally, children need to know how to use language appropriately. This entails, among other things, knowledge of Gricean conventions, and ability to paraphrase or explain verbal statements.

The third limitation is an information processing limitation. Children are limited information processors and their ability to deal with more complex tasks increases with age. This could be either the result of a developmental change in memory capacity (e.g., Pascual-Leone, 1970; Case, 1978) or of increased knowledge and improved strategies (Chi, 1978; Brown, 1978).

If these limitations are the principal ones governing the understanding of nonliteral, then it ought to be possible to show that quite young children can understand figurative expressions when some of these limitations are bypassed. This

has already been shown in a number of cases (Gardner, 1974; Gentner, 1977; Vosniadou & Ortony, 1983). This paper will be focused on children's comprehension of metaphorical language. We will argue that the linguistic form in which a metaphor is expressed and the context in which it occurs can facilitate children's comprehension by helping them bypass their epistemic linguistic and information processing limitations.

Linguistic Form

Metaphorical expressions can take many different forms; they can be expressed as predicative metaphors (Love is a red rose), as similes (Reality is like a sledge hammer), as analogies (white blood cells fight germs like soldiers fight an invading enemy), or may combine the predicative and the analogical (The New Yorker is the quiche of newspapers); they can have the topic and the vehicle stated explicitly (Sam was a fly in a bottle), or implicitly--as it is in many proverbs like "Don't put the cart before the horse," where the vehicle may be mapped onto a number of unstated topics.

It appears that some of these forms are easier to understand than others. For example, Reynolds and Ortony (1980) found metaphors with explicit topics easier to understand than metaphors with implicit topics. Winner, Engel and Gardner (1980) found riddles (What is like a scar but marks the sky?) and quasi-analogies (A scar marks the body like sky writing marks the sky) easier to explain than predicative metaphors (The skywriting was

a scar marking the sky) or topicless metaphors (The scar marked the sky).

Such differences in comprehension may arise because some linguistic forms are more familiar than others and therefore children are more likely to know how to interpret them. Some linguistic forms may also require fewer or less complex cognitive operations to interpret them and therefore are less likely to tax the limited information processing abilities of young children. Some of these hypotheses were investigated in a series of experiments by Vosniadou, Ortony, Reynolds, and Wilson (1984).

In these experiments preschool and elementary school children listened to short stories which concluded with a metaphorical sentence and acted out the actions described by the stories and the metaphorical concluding sentences with toys. Comprehension was assessed on the basis of the children's enactments. In one experiment, linguistic form was manipulated by expressing the concluding sentences either as metaphors or as similes. We hypothesized that metaphors would be harder for children to enact than similes because of their implicit nature. Metaphors have the surface form of a predicative statement but are intended to express an implicit nonliteral comparison. Similes express a nonliteral comparison explicitly.

As expected, the four and six year old children who participated in this experiment found metaphors easier to enact than similes. It could be argued that because of their implicit

nature the metaphors required more complex cognitive operations to be interpreted than the similes, therefore taxing the limited information processing abilities of young children. It could also be argued that the metaphors were less familiar linguistic forms than the similes, and therefore the children did not know how to interpret them.

In a subsequent experiment (Vosniadou, et al., 1984), the effect of linguistic form on children's comprehension of metaphorical language was further investigated by changing the verb of the metaphorical concluding sentences. In this experiment, the metaphorical sentences contained either a verb which could be enacted literally ("Paul was a rabbit running to his hole"), or a verb for which a literal enactment was inappropriate ("Paul was a rabbit hopping to his hole"). It was hypothesized that the sentences with the nonliteral verbs would be more difficult to understand than those with literal verbs, because the process of assigning a meaning to these sentences involved an additional metaphorical substitution over and above the metaphorical substitutions required by the sentences with the literal verbs. As expected, both the preschool and the first grade children found it more difficult to enact the metaphorical sentences with the nonliteral verbs than the ones with literal verbs, presumably because of their greater information processing requirements. The possibility also exists that metaphors around verbs are more difficult to comprehend than those around nouns

because of the relational nature of verbs (e.g., Gentner, 1985, but see Dent, 1984 and Vosniadou, submitted). Such an argument would place the difficulty on children's epistemic rather than information processing limitations.

Taken together, the results of these experiments confirmed previous findings and provided further support to the hypotheses that the linguistic form in which a metaphorical sentence is expressed can affect the ease or difficulty with which this sentence is comprehended. The same metaphorical expression can be easier to understand when expressed in a linguistic form which is familiar to young children, and thus more likely to be known given the limited linguistic knowledge of the young child. It is also easier to understand metaphorical sentences when expressed in linguistic forms which impose fewer demands on the child's limited knowledge or information processing abilities.

Context

Language usually occurs in some linguistic and/or situational context and this context provides important information about how a given linguistic input should be interpreted. The interdependence between language and context is central to many theories of language (e.g., Austin, 1962; Grice, 1957; Searle, 1979a). If context is important in understanding literal uses of language, it is even more important in understanding nonliteral uses of language. In literal uses of language the speaker meaning (the meaning a speaker intends for a

sentence in a given context) is consistent with the sentence meaning (the meaning one would customarily assign to this sentence out of context). However, in nonliteral uses of language, there is a discrepancy between speaker and sentence meaning (Searle, 1979b). In these cases, the context in which a sentence occurs can provide important information to the hearer about how to interpret that sentence. First, it can signal that a particular sentence must receive a nonliteral interpretation (since a literal interpretation would not make sense in that context), and, second, it can provide clues about the possible meanings one could assign to this sentence.

Because of their limited linguistic knowledge children depend heavily on contextual information when they assign a meaning to a linguistic input. It has often been suggested that the way children break the linguistic code is by utilizing contextual information to interpret linguistic inputs (Bloom, 1970; Macnamara, 1972; Nelson, 1974). Recently, Olson and Hillgard (1980; Hillgard & Olson, 1982) argued that children first construct sentence meanings based primarily on contextual information. The ability to rely exclusively on linguistic information to interpret a sentence meaning is, according to Olson, a late development.

It should not be surprising, therefore, if young children use contextual information to interpret nonliteral language. In fact, it might be the case that metaphor comprehension is

originally achieved only in situations where the already established context strongly leads to inferences that are consistent with the metaphor's implied meaning. By hearing and trying to make sense out of metaphorical language in a variety of contexts, children can gradually become aware of the different uses of nonliteral language and of the variety of meanings they might express.

The role of context on children's comprehension of metaphorical language was explored in experiments by Vosniadou et al. (1984) and Vosniadou and Ortony (in press). In one of these experiments children acted out stories which concluded with metaphorical sentences representing either relatively likely story outcomes ("more probable metaphors"), or less likely story outcomes ("less probable metaphors"). The degree to which the metaphorical concluding sentences represented more or less probable story outcomes was determined on the basis of a control group. In this control group the children heard the stories without the concluding sentence and were asked to act out their own endings. Of the endings provided, 55% were the same as the actions described by the more probable concluding metaphors, while only 27% matched the actions described by the less probable metaphors. The following is presents one of these stories with a more probable and a less probable metaphorical sentence.

Billy invited some of his friends to his house, so his mother baked some cookies. She told Billy not to eat the cookies before his friends arrived and she sent him to his room to play. Then she put the cookies in the cupboard and went out to the back yard. After his mother left, Billy came down. He opened the cupboard and found the cookies. He was ready to eat the first cookie when he heard his mother coming back in.

More Probable Concluding Sentence:

"Billy was a squirrel burying the nuts."

Less Probable Concluding Sentence:

"Billy was a squirrel heading for his tree."

The results of this experiment showed that the context in which the metaphorical sentence occurred had a dramatic effect on comprehension. While all children could easily enact the implied meaning of the metaphors representing the more probable story endings, they had difficulty enacting the less probable metaphors. This difficulty was particularly noticeable in the case of the preschool children, who rarely performed a correct enactment of the less probable metaphorical sentences.

How does contextual information affect metaphor comprehension? One explanation is that children simply guess the meaning of the metaphor on the basis of the contextual

information alone, ignoring the linguistic input. This explanation is not consistent with the finding that the proportion of correct enactments for the more probable metaphors was greater in the case of all the children in the experimental group than the children in the control group (see Figure 1). Since the children in the control group also had access to the contextual information, the better performance of the experimental group can be explained only if one assumes that these children derived some information from the metaphorical input itself. In addition, many of the first and third grade children enacted correctly the less probable metaphors, whose meaning was not consistent with the contextual information.

Insert Figure 1 about here.

A different explanation is that children draw inferences both on the basis of the contextual information and on the basis of the linguistic input itself and use both of these inferences to make hypotheses about the meaning of the metaphor. When the inferences based on the linguistic input are consistent with the inferences based on the contextual information, the comprehension task (i.e., constructing a meaning) is easier than when the two types of inferences are in conflict. Understanding the less probable metaphorical sentences requires using the inferences based on the linguistic input to revise the hypotheses made on

the basis of the contextual information alone. It appears that children find it difficult to do such hypothesis revision when dealing with metaphors.

The problem does not appear to be hypothesis revision itself, since children of the same age had no difficulty revising contextually based hypotheses when the less probable endings were expressed in literal language. Neither does it appear to stem from metaphoricity itself, since the children did not have problems understanding metaphorical sentences when their meaning was consistent with the contextual information. Problems appeared only when metaphoricity and hypothesis revision were combined, presumably because the complexity of the metaphor comprehension task increased.

If the problem with enacting the less probable metaphors was due to the increased complexity of the metaphor comprehension task, comprehension should improve if the task was made less complex by employing similes rather than metaphors. Vosniadou et al. (1984) tested this hypothesis by manipulating contextual predictability (more and less probable metaphorical sentences) and linguistic complexity (similes vs metaphors) at the same time. It was hypothesized that young children would find it easier to enact less probable metaphorical sentences if expressed as similes rather than as metaphors.

As Figure 2 shows, the results of this experiment confirmed the hypothesis. Both preschool and first grade children were

much more likely to enact correctly the less probable metaphorical sentences when they were expressed as similes than when they were expressed as metaphors. These results indicated that children are able, in principle, to understand nonliteral sentences even when their meaning requires some revision of the hypotheses invited by the linguistic and situational context. However, there appear to be limits to the complexity of the metaphorical linguistic inputs whose meanings can be derived without or in spite of the contextual bias.

Insert Figure 2 about here.

A second question raised by these studies concerns the role of the situational context in language comprehension. In all the experiments reported so far, the children enacted the metaphorical sentences with toys in a "toy world" environment. This "toy-world" environment did not include literal toy referents for the words used metaphorically. In other words, children were not given toy squirrels and toy nuts when they were asked to enact the meaning of the metaphorical sentence "Billy was a squirrel hiding the nuts."

It may be objected that the absence of literal toy referents biased the children towards nonliteral interpretations of the metaphorical sentences, despite the ecological validity of the task. It is, of course, hardly ever the case that a metaphor is

uttered in a context that includes the literal referents of the terms used metaphorically. Nevertheless, one wonders what would happen if the situational context included literal referents.

In a yet unpublished study, the presence of literal toy referents for the words used metaphorically was manipulated. In this study thirty-two six year old children listened to six short stories which concluded either with a simile or with a metaphor. Half of the children acted out the stories with toys which included literal toy referents for the words used metaphorically, while the other half did not have such literal distractors. Thus, there was a total of four groups of subjects; a group with metaphors and literal distractors, a group with similes and literal distractors, a group with metaphors but no literal distractors and a group with similes but no literal distractors.

As can be seen in Table 1, the presence of the literal distractors had a negative impact on metaphor comprehension; correct enactments of the metaphorical sentences decreased while literal enactments increased when distractors were present. However, the difference between the distractor and no distractor group was greater in the case of the metaphors than in the case of the similes. As was the case in the previous experiment, the children could deal better with misleading contextual information when the complexity of the linguistic input decreased, i.e., when metaphors were changed to similes.

Insert Table 1 about here.

Overall, the results of these experiments demonstrated that the linguistic and situational context in which a metaphorical sentence occurs affects its comprehension. It has been argued that children draw inferences on the basis of the contextual information which reduce their reliance on the linguistic input itself. Such inferences help the children bypass the linguistic constraint. In addition, the relationship between the contextual information and the linguistic input can affect the information processing requirements of the comprehension task and thus facilitate or hinder comprehension.

The Interaction Between Linguistic Form and Context

As mentioned in the previous section, in addition to their independent effects, the linguistic and contextual variables interacted in interesting ways to affect metaphor comprehension. In order to understand how the interaction of these variables affected comprehension, Vosniadou et al. (1984) hypothesized that each of the manipulated variables contributes an additional source of difficulty to the comprehension task when this variable is set at a more difficult level. In other words, less probable metaphors involve an additional source of difficulty relative to the more probable metaphors, metaphorical sentences with nonliteral verbs involve an additional source of difficulty

relative to metaphorical sentences with literal verbs, and metaphors involve an additional source of difficulty relative to similes. We then assumed that each source of difficulty increased the overall difficulty of the metaphor comprehension task by at least one theoretically distinguishable step.

Insert Figure 3 about here.

Figure 3 summarizes the results of these experiments conceptualized in this way. The metaphorical sentences have been assigned to one of four levels of difficulty. The simplest level of difficulty, level 0, represents the more probable similes with literal verbs. Difficulty level 1 represents the (a) more probable metaphors with literal verbs, (b) less probable similes with literal verbs, and (c) more probable similes with nonliteral verbs. In all of these conditions, an additional source of difficulty is present relative to the metaphorical sentences at difficulty level 0. This additional difficulty results either from the need to interpret the implicit comparison in the case of the metaphor, or to revise the original hypotheses supported by the linguistic context, or from the need to determine the nonliteral verb's implied action. Difficulty level 2 introduces two such sources of difficulty, and difficulty level 3, introduces three levels of difficulty.

As Figure 2 shows, the proportion of correct enactments decreased as the difficulty level of the metaphor comprehension task increased. Preschool children generally failed to correctly enact metaphorical sentences beyond level 1, whereas first grade children appeared better able to deal with metaphorical sentences up to level 2. These results indicate that what matters is not so much whether a given metaphorical sentence is expressed as a simile or as a metaphor, or whether it is more or less predictable on the basis of the context, but rather what the total level of difficulty of that metaphorical sentence is.

Summary and Conclusions

It has been argued that variables such as the linguistic form of a nonliteral expression, and the context in which it occurs can greatly influence young children's success or failure to assign a meaning to a figurative expression. Some experiments supporting this position were discussed in the context of children's comprehension of metaphorical language. These experiments are consistent with the hypothesis that the development of metaphor comprehension skills in children is not so much related to metaphor-specific abilities, or a particular developmental stage (e.g., concrete, formal operations), but, rather, is largely due to increases in children's epistemic, linguistic, and information processing abilities.

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Table 1

Proportion of Correct and Literal Enactments as a Function of Metaphor Type and Distractor Condition

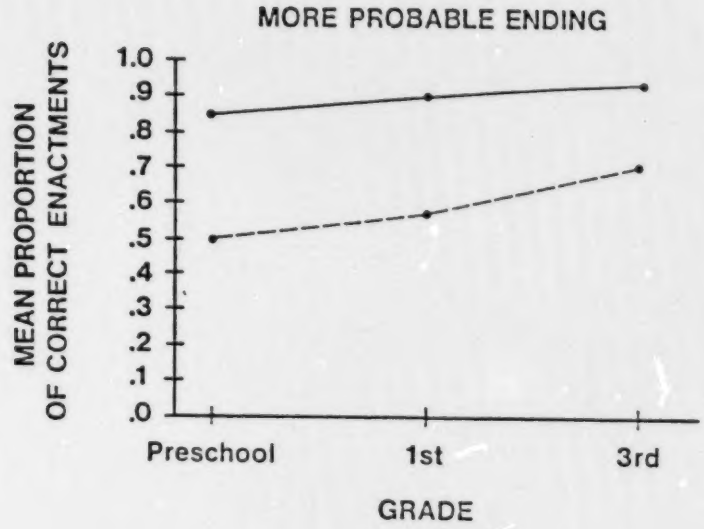
Metaphor Type	No Distractors		Distractors	
	Correct	Literal	Correct	Literal
Metaphors	.34	.14	.20	.32
Similes	.42	.02	.36	.08

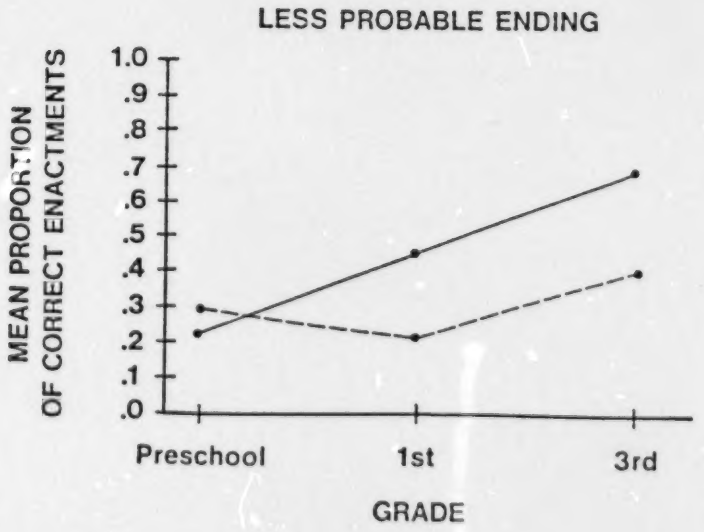
Figure Captions

Figure 1. Mean Proportion of Correct Enactments for the Experimental and No Ending Control Group for the More Probable-Less Probable Metaphorical Ending Comparison

Figure 2. Mean Proportion of Correct Enactments for the Experimental and No Ending Control Group for the Simile-Metaphor Comparison

Figure 3. Mean Proportion of Correct Enactments for the Metaphorical Sentences


MORE PROBABLE ENDING
MEAN PROPORTION OF CORRECT ENACTMENTS
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
.0
Preschool
1st
3rd
GRADE


LESS PROBABLE ENDING
MEAN PROPORTION OF CORRECT ENACTMENTS
1.0
.9
.8
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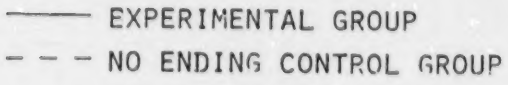
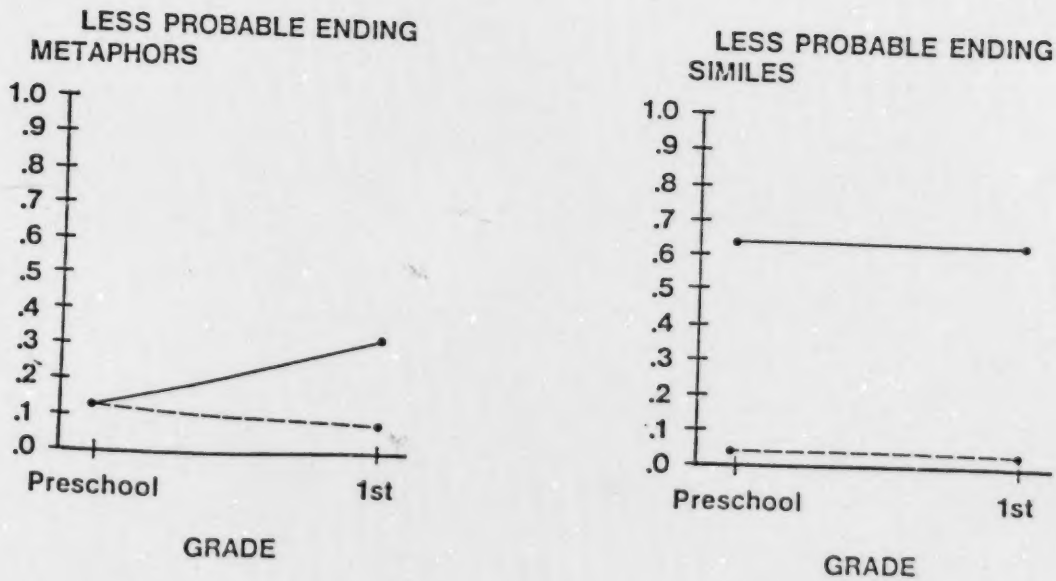
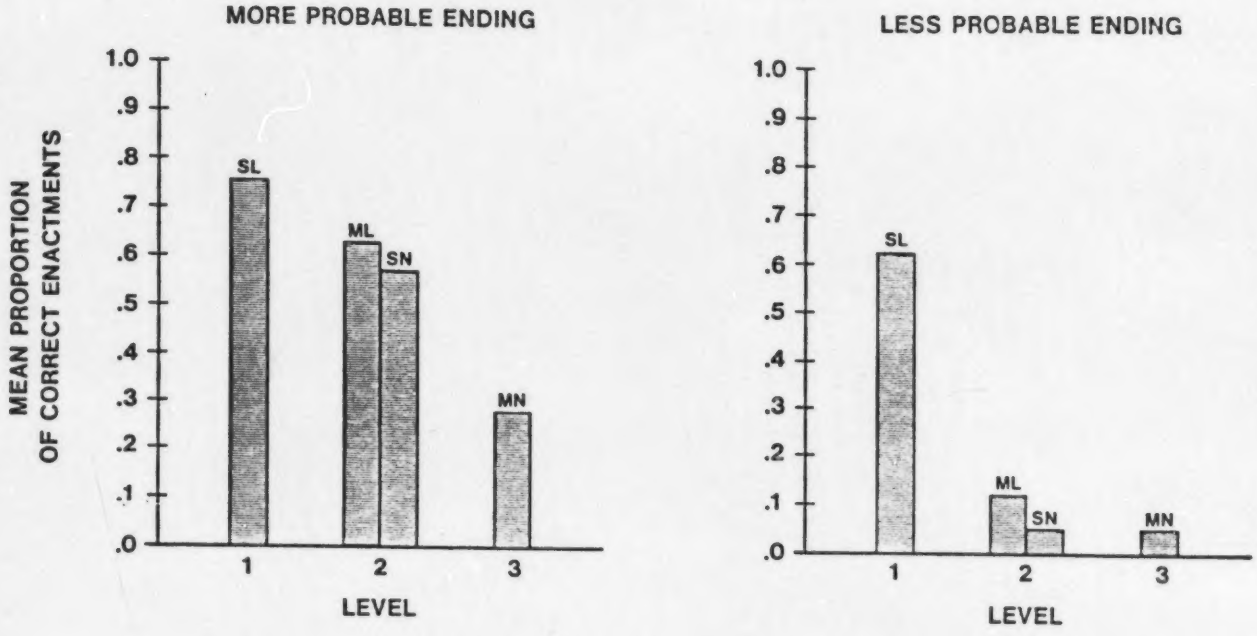
.4
.3
.2
.1
.0
Preschool
1st
3rd
GRADE

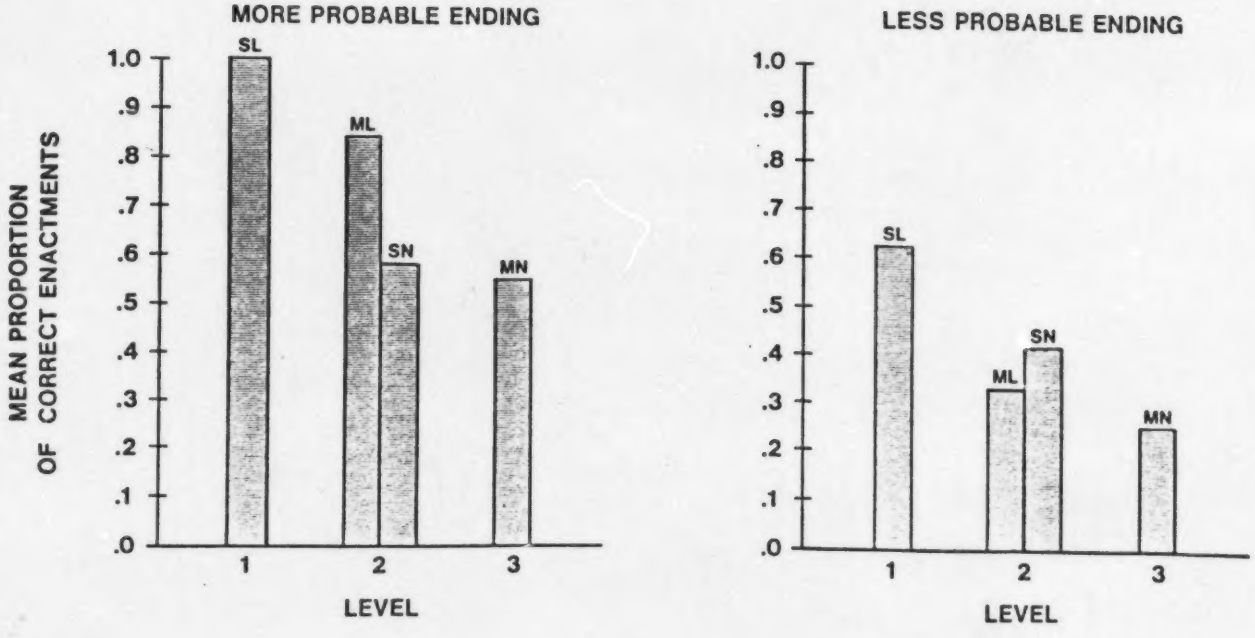

EXPERIMENTAL GROUP
NO ENDING CONTROL GROUP


LESS PROBABLE ENDING
METAPHORS
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
.0
Preschool
1st
GRADE
LESS PROBABLE ENDING
SIMILES
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
.0
Preschool
1st
GRADE
EXPERIMENTAL GROUP
NO ENDING CONTROL GROUP

PRESCHOOL



1ST GRADE



S: Simile
M: Metaphor
L: Literal Verb
N: Nonliteral Verb